

CLAIMS

1. A two-dimensional image display device for displaying an image by projecting coherent light on a projection plane, comprising:

at least one coherent light source for outputting coherent light;

a polarization state modulator for modulating at least one of a polarization state and a phase of the coherent light emitted from the coherent light source; and

a birefringent diffusion plate for spatially varying the phase of the coherent light emitted from the polarization state modulator;

wherein the coherent light, the phase of which is varied by the polarization state modulator, is projected onto the projection plane.

2. A two-dimensional image display device as defined in Claim 1 wherein said birefringent diffusion plate and said projection plane are in an image forming relation.

3. A two-dimensional image display device as defined in Claim 1 wherein the birefringent diffusion plate has a coherent light incident plane which is spatially regionally divided, and the respective regions have directions of their optical axes which

are randomly set.

4. A two-dimensional image display device as defined in Claim 1 wherein the birefringent diffusion plate has a coherent light incident plane which is spatially regionally divided, and random phase delay amounts of the coherent light are generated in the respective regions.

5. A two-dimensional image display device as defined in Claim 1 wherein the birefringent diffusion plate has a coherent light incident plane which is spatially regionally divided, and the respective regions have directions of their optical axes which are randomly set, and generate random phase delay amounts of the coherent light.

6. A two-dimensional image display device as defined in Claim 1 wherein two or more pieces of said birefringent diffusion plates are disposed on an optical path from the coherent light source to the projection plane.

7. A two-dimensional image display device as defined in Claim 4 or 5 wherein, in said birefringent diffusion plate, the phase delay amount $\Delta\phi$ satisfies $0 \leq \Delta\phi \leq 2\pi$, and the phase delay amount is generated at an approximately uniform rate.

8. A two-dimensional image display device as defined in Claim 1 wherein said birefringent diffusion plate is formed of a ferroelectric crystal.

9. A two-dimensional image display device as defined in Claim 1 wherein said birefringent diffusion plate includes a liquid crystal as a component material.

10. A two-dimensional image display device as defined in Claim 1 wherein two pieces of said polarization state modulators are disposed in series on an optical path from the coherent light source to the projection plane so that the directions of optical axes of the polarization state modulators are different from each other.

11. A two-dimensional image display device as defined in Claim 10 wherein said two polarization state modulators modulate at least one of the polarization state and the phase of the coherent light emitted from the coherent light source, with different frequencies from each other.

12. A two-dimensional image display device as defined in Claim 1 wherein said polarization state modulator and said birefringent diffusion plate are integrally fabricated.

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13. A two-dimensional image display device as defined in Claim 1 further including a two-dimensional beam scanning system for scanning the coherent light emitted from the coherent light source in a two-dimensional direction so that an image is displayed on the projection plane.

14. A two-dimensional image display device as defined in Claim 1 wherein said polarization state modulator modulates at least one of the polarization state and the phase of the coherent light emitted from the coherent light source, with a frequency f that satisfies formula (1) as follows:

$$f \geq X \times Y \times N (\text{Hz}) \quad \dots (1)$$

wherein X is the number of pixels in the horizontal direction of the image displayed on the projection plane, Y is the number of pixels in the vertical direction of the image displayed on the projection plane, and N is the number of pixels displayed per second.

15. A two-dimensional image display device as defined in Claim 1 wherein said polarization state modulator is an optical modulator using electro-optical effect.

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